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10/588,549	04/13/2007	Masahide Matsuura	294551US0PCT	8443
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER YANG, JAY	
			ART UNIT	PAPER NUMBER
			1786	
			NOTIFICATION DATE	DELIVERY MODE
			02/14/2012	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary**Application No.**

10/588,549

Applicant(s)

MATSUURA ET AL.

Examiner

J. L. Yang

Art Unit

1786

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-8 and 10-28 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-8 and 10-28 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-853)
Paper No(s)/Mail Date 04/27/11; 09/13/11
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/27/11 has been entered.

Response to Amendments

1. The rejection of Claims 1-8, 14-16, 18, 19, and 21-25 under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Mishima et al. (US 2002/009695 A1) as evidenced by Nii (US 6,693,295 B2) and Tsuboyama et al. 2 (US 6,783,873 B2) as set forth in the Office Action filed 10/27/10 is overcome by argument.

2. The rejection of Claim 17 under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Mishima et al. (US 2002/0096995 A1) and Tyan et al. (US 2005/0073228 A1) as evidenced by Nii (US 6,693,295 B2) and Tsuboyama et al. 2 (US 6,783,873 B2) as set forth in the Office Action filed 10/27/10 is overcome by argument.

3. The rejection of Claims 10-13 under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Mishima et al. (US 2002/0096995 A1) and Begley et al. (US 2005/0208327 A1) as evidenced by Nii (US 6,693,295 B2) and Tsuboyama et al. 2 (US 6,783,873 B2) as set forth in the Office Action filed 10/27/10 is overcome by argument.

4. The rejection of Claim 20 under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Mishima et al. (US 2002/0096995 A1) and Lamansky et al. (US 2002/0182441 A1) as evidenced by Nii (US 6,693,295 B2) and Tsuboyama et al. 2 (US 6,783,873 B2) as set forth in the Office Action filed 10/27/10 is overcome by argument.

Examiner's Note

1. The Examiner has relied upon the machine English translation of national phase publication KR 1020047014947 as the English translation of WO 03/080760 A1 (herein referred to as Iwakuma et al.).

Claim Rejections – 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

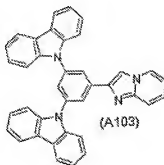
3. Claims 1-8 and 14-16, 18, 19, 21-25, 27, and 28 are rejected under 35 U.S.C.

103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Iwakuma et al. (WO 03/080760 A1; KR 1020047014947) as evidenced by Tsuboyama et al. 2 (US 6,783,873 B2).

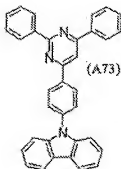
Regarding Claims 1-8, 15, 16, 18, 19, 21-25, 27, and 28, Tsuboyama et al. discloses an organic EL device comprising a cathode (11), an electron-transporting layer (16), a light-emitting layer (12a), a hole-transporting layer (13), an anode (14), and a substrate 915) in that order (Drawing 1). Tsuboyama et al. discloses the construction of flat panel displays that comprises such organic EL devices ([0069]). Tsuboyama et al. discloses the use of nitrogen-containing aromatics such as CBP (which has two carbazole groups) as host material for the light-emitting layer and Ir(ppy)₃, a phosphorescent metal complex, as the light-emitting dopant at 6% ([0104], [0018]). Tsuboyama et al. discloses the use of aluminum quinolate as material for the electron-transporting layer ([0113]). However, Tsuboyama et al. does not explicitly disclose an

electron-transporting material with a hole mobility greater than the limit as recited by the Applicant in Claim 1.

Iwakuma et al. discloses a series of compound that can be used as either host material (in the light-emitting layer, Claim 15) or as electron-transporting material of the electron-transporting layer (page 9) of an organic EL device. Such compounds include:



(page 18) which has $E_g = 3.44$ eV, $E_g^T = 2.8$ eV, and $I_p = 5.5$ eV (page 42, present Specification) and



(page 16) which has $E_g = 3.2$ eV, $E_g^T = 2.8$ eV, and $I_p = 5.6$ eV (page 42, present Specification). It would have been obvious to incorporate such materials as electron-transporting material to the electron-transporting layer (or also as host material) of the organic EL device as disclosed by Tsuboyama et al. The motivation is provided by the fact that such compounds as disclosed by Iwakuma et al. are known materials for

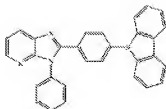
effective electron-transporting/host material for use in an organic EL device, rendering the incorporations predictable with a reasonable expectation of success. This would result in a difference in $I_p(\text{electron-transporting material}) - I_p(\text{host material}) = (5.6 \text{ eV or more}) - (5.5 \text{ eV}) = 0.1 \text{ eV}$ which is within the range as claimed by the Applicant. It should be noted that such compounds, as they are equivalent to the inventive compounds as disclosed by the Applicant, would meet the hole mobility requirements as claimed.

Regarding Claim 14, the triplet energy of $\text{Ir(ppy)}_3 = 2.4 \text{ eV}$ as disclosed by Tsuboyama et al. 2 (col. 7, lines 50-52).

4. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Iwakuma et al. (WO 03/080760 A1; KR 1020047014947) as evidenced by Tsuboyama et al. 2 (US 6,783,873 B2) as applied above and in further view of Mishima et al. (US 2002/0096995 A1)

Tsuboyama et al. in view of Iwakuma et al. as evidenced by Tsuboyama et al. 2 discloses the organic EL device of Claim 1. However, they do not explicitly disclose a host material with a triplet energy 3.3-3.7 eV.

Mishima et al. discloses a wide range of nitrogen-containing aromatic compound for use as electron-transporting material in an organic EL device exemplified below:



(page 6).

Tyan et al. discloses the possibility of using electron-transporting materials as host material with dopants = phosphorescent metal complexes ([0099]). It would thus have been obvious to one of ordinary skill in the art to incorporate any of the electron-transporting materials as disclosed by Mishima et al. as host material to the organic EL device as disclosed by Tsuboyama et al. in view of Iwakuma et al. as evidenced by Tsuboyama et al. 2. The motivation is provided by the fact that the use of electron-transporting materials as host materials are known as disclosed by Tyan et al., in addition to the fact that the electron-transporting compounds as disclosed by Mishima et al. belong to the same class of nitrogen-containing aromatic compounds as disclosed above by Iwakuma et al. (along with meeting the energetic requirements of having a higher triplet energy than the iridium complex for efficient energy transfer to the dopant) with a triplet energy gap of 2.6-3.9 eV (Mishima et al., [0023]).

5. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (JP 2002-343572 A) in view of Iwakuma et al. (WO 03/080760 A1; KR 1020047014947) as evidenced by Tsuboyama et al. 2 (US 6,783,873 B2) as applied above and in further view of Begley et al. (US 2005/0208327 A1).

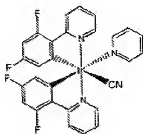
Tsuboyama et al. in view of Iwakuma et al. as evidenced by Tsuboyama et al. 2 discloses the organic EL device according to Claim 1 as shown above. However, they do not explicitly disclose a device comprising a plurality of electron-transporting layers.

Begley et al. discloses an organic EL device and the possibility of having multiple adjacent electron-transporting layers (Fig. 1 vs. Fig. 4), both of which are located between the cathode and the EL material layer. It would thus have been obvious to one of ordinary skill in the art at the time of the invention to incorporate an additional layer comprising another electron-transporting derivative as disclosed by Iwakuma et al. The motivation is provided by the fact that such architecture is known as disclosed by Begley et al. that can promote enhanced electron transmittance. This would result in adjacent electron-transporting layers with similar (or identical if the same electron-transporting compounds is used) I_p values (such that $\Delta I_p = \sim 0$) that can meet the optical energy and triplet energy gap limitations as claimed by the Applicant after a reasonable amount of experimentation (involving the compositions of just two layers).

6. Claim 20 is rejected under 35 U.S.C. 103(a) as being anticipated by Tsuboyama et al. (JP 2002-343572 A) in view of Iwakuma et al. (WO 03/080760 A1; KR 1020047014947) as evidenced by Tsuboyama et al. 2 (US 6,783,873 B2) as applied above and in further view of Lamansky et al. (US 2002/0182441 A1).

Tsuboyama et al. in view of Iwakuma et al. as evidenced by Tsuboyama et al. 2 discloses the organic EL device according to Claim 1 as shown above. However, they do not disclose a phosphorescent complex with CN as ligand.

Lamansky et al. discloses the following light-emitting dopant:



(Fig. 7e, sheet 17). It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the above complex for Ir(ppy)₃ in the light-emitting layer of the organic EL device as disclosed by Tsuboyama et al. in view of Iwakuma et al. as evidenced by Tsuboyama et al. 2. The motivation is provided by the fact that the dopant as disclosed by Lamansky et al. too is a phosphorescent iridium complex with a particular spectral profile in addition to the fact that Tsuboyama et al. allows for a wide variety of phosphorescent dopants ([0048]) such that the substitution would have been predictable with a reasonable expectation of success.

Response to Arguments

1. The Examiner appreciates the Applicant's note regarding Mishima et al., especially in regards to the differences between the hole mobility and the ionization potential as shown on page 13. However, Applicant's arguments with respect to the deficiencies found in the previous Office Action have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. Yang whose telephone number is (571)270-1137. The examiner can normally be reached on Monday to Thursday from 8:30 am to 6:00 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer A. Chriss can be reached on (571)272-7783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A Chriss/
Supervisory Patent Examiner, Art Unit 1786

/J. L. Y./
Examiner, Art Unit 1786